

THURSDAY, MAY 29, 1884

## THE DILUTION OF DOG POISON

M. PASTEUR has communicated to the French Academy of Sciences (May 19, 1884) the results of his experiments on the attenuation of the virus of rabies, which, if they should be confirmed, would furnish us with the means of protecting dogs from rabies, and as a necessary sequel of protecting the human race from hydrophobia, that absolutely deadly and intractable disease which in every country where rabies exists devours every year some hundreds of human victims.

Starting from the idea, now well established for at least some of the infectious maladies, viz. that the virus of a particular disease of this class on its passage through different species of animals is subject to alteration of its virulence, M. Pasteur inoculated monkeys with the virus taken from a dog affected with rabies, and found that it thereby became considerably altered. This alteration consists in a decrease of intensity, and it is the more marked the greater the number of removes. After the third remove (*i.e.* after having passed successively through three monkeys) it becomes attenuated to such a degree that inoculation with it of dogs, rabbits, and guinea-pigs does not produce fatal rabies. Dogs so inoculated remain protected against further virulent poison such as is derived from a rabid dog.

But on the other hand the virus of rabies on its passage through the rabbit and guinea-pig increases in virulence, its intensity becoming even greater than that of the virus taken from a dog, rabid in the usual way (*rage des rues*). The maximum increase in intensity is not, however, attained until several transmissions through the rabbit or guinea-pig.

In this way it is possible to produce virus of various degrees of intensity, from the weakest, *i.e.* virus taken from the rabid dog and passed successively through several monkeys, to the strongest, *i.e.* virus passed successively through several rabbits or guinea-pigs.

M. Pasteur states that he has succeeded, by inoculation of the blood of rabid animals, in devising a simple method of obtaining attenuation of the virus, and of herewith protecting dogs from fatal rabies, but the experiments not being yet completed do not permit of a detailed description.

Without wishing to say anything derogatory as regards these remarkable results, it is greatly to be regretted that M. Pasteur, not being himself a pathologist, has not availed himself of the aid of his medical colleagues, in order to definitely ascertain whether the disease which he produced by inoculation in the dog, monkey, rabbit, and guinea-pig—for this seems to be at the root of his statements—was really rabies. However, he has asked and obtained from the French Minister of Public Instruction a Commission which is to compare the results of the inoculation, from a rabid dog, of twenty dogs, previously treated by M. Pasteur with his attenuated virus, with those of the inoculation of twenty other dogs not previously “vaccinated.”

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This Commission, comprising such acknowledged authorities in physiology and pathology as M. Bécclard, M. Paul Bert, M. Bouley, Dr. Villemin, and Dr. Vulpian, will no doubt soon be able to decide this question one way or the other, and its judgment will be awaited by all medical men as well as by the general public with any-thing but indifference.

The experiments of M. Pasteur, published in the *Comptes Rendus* of the Academy of Sciences for May 19, are these :—

I. “If rabies is transmitted from the dog to the monkey, and further, from monkey to monkey, the virulence of the virus becomes weakened on each transmission. The virus, having become diminished in virulence by these transmissions from monkey to monkey, if reintroduced into the dog, rabbit, or guinea-pig, maintains its attenuated character. In other words, the virulence does not return at a bound to the virulence of the virus of a dog affected with rabies of the usual kind, *i.e.* produced by the bite of a dog (*à rage des rues*).

“Under these conditions the attenuation can easily be accomplished by a small number of transmissions from monkey to monkey, to such a point that it does not produce rabies in the dog by hypodermic inoculation. Even inoculation by trephining, an infallible method to communicate rabies, cannot produce any result; it creates nevertheless a refractory condition of the animal against rabies.

II. “The virulence of the rabid virus increases on its passage from rabbit to rabbit, and from guinea-pig to guinea-pig. When in this way the virulence has reached its maximum in the rabbit, it can be transmitted in this state to the dog, and it shows here a much greater intensity than the virus obtained from a dog affected with rabies in the usual manner (*rage des rues*). This virulence is of such an intensity that after inoculation into the blood of a dog it invariably produces fatal rabies.

III. “Although the virulence increases on the passage of the virus from rabbit to rabbit, or from guinea-pig to guinea-pig, it requires several successive transmissions through these animals to attain its maximum, having previously become attenuated by its passage through the monkey. Similarly the virulence of the ordinary rabies of the dog, which, as we have just shown, is not by any means the greatest that the rabid virus is capable of attaining, requires several successive transmissions through the rabbit in order to attain its maximum.

“It follows from the experiments just described that we can easily render dogs proof against rabies. It is readily understood that the experimenter can at will procure rabid virus attenuated in various degrees: some, non-fatal, protecting the animal from the effect of more active as well as of fatal virus.

“The following example illustrates this:—Extract by trephining from a rabbit dead of rabies after an incubation prolonged by several days beyond the shortest period of incubation in the rabbit. This latter is generally comprised within seven to eight days after inoculation, by trephining, with the most intensive virus. From the above rabbit, *i.e.* the one with the prolonged incubation, virus is taken and inoculated, always by trephining, into a second rabbit; from this again virus is taken and inoculated into a third rabbit. Each of these different samples

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of virus, increasing in strength on every transmission, is at the same time inoculated into a dog. This latter will then be found capable of resisting the most fatal virus, having become completely refractory to rabies, no matter whether the virus, derived from a case of common rabies (*rage des rues*), is introduced by intravenous inoculation or by trephining."

### THE MAMMALIA OF INDIA AND CEYLON

*Natural History of the Mammalia of India and Ceylon.*

By Robert A. Sterndale, F.R.G.S., F.Z.S. (Calcutta: Thacker, Spink, and Co.; London: Thacker and Co., 1884.)

THIS book may fairly be described as an attempt by an unscientific writer to compile a scientific work. The author is favourably known as a describer of Indian wild sports, and his observations on the habits of animals are generally good and often original. His best known publication, "Seonee or Camp Life in the Satpura Range," although not quite equal to Forsyth's delightful "Highlands of Central India," rises above the level of ordinary Indian sporting works. In the volume now published he has attempted the somewhat ambitious task of compiling a popular manual of Indian mammalia, comprising not only those described in Jerdon's "Mammals of India" (which is restricted to the kinds found in the Indian Peninsula and the Himalayas), but also the species living in Assam, Burmah, Ceylon, and "the countries bordering the British Indian Empire on the north." By including some (not all) of the mammals described by A. Milne-Edwards from Eastern Tibet, several of those recorded by various authors from Kashgaria, Afghanistan, and Persia, and some Malay types, the total number of species enumerated is brought up to 482. This number, however, is partly made up by nominal species, the writer having compiled his lists from various authorities of unequal value.

Had Mr. Sterndale confined his descriptions to the larger and better known mammals of India and the surrounding countries, he might possibly have achieved greater success. He has bestowed much labour upon the book, and has in some cases, but unfortunately not in all, had recourse to good and recent information. Thus he adopts Flower's and Mivart's classification of the *Carnivora*, and Alston's arrangement of the rodents, whilst he places the dugong in the *Cetacea*, and *Galeopithecus* amongst the lemurs.

The actual descriptions of species are for the most part taken from other writers, and the same may be said of localities, which, however, are not always correct, even in the case of the larger and better known animals. Thus the markhor (*Capra falconeri* v. *megaceros*) is said to be found in Ladakh, where it does not occur, although common in Astor and Gilgit, and the hog-deer, *Axis porcinus*, is stated to exist "throughout India, though scarce in the central parts," whereas it is not known with certainty to inhabit any part of the peninsula of India except the plains of the Ganges and Indus. Many other instances might be quoted. Mr. Sterndale is not even aware that *Tragulus kanchil* exists in Tenasserim, although its occurrence there was well known to Blyth, at least twenty-five years ago. He is unaware also that *Canis lupus* has been obtained in Gilgit, and *Nectogale*

*elegans* in Sikkim. But although *Tragulus kanchil* does not receive a number and separate notice as one of the Indian mammalia, *Mustela nudipes*, a purely Malay insular type, not recorded from continental Asia, is included in the list as No. 190, with the remark that "this species may be discovered in Tenasserim." There is a want of system in the admission and exclusion of species throughout. Thus *Macacus thibetanus* (No. 23) and *Nemorhadus edwardsii* (No. 453) are described, whilst *Semnopithecus roxellana*, *Elaphodus cephalophus*, and *Cervulus lachrymans* are ignored, although all are from the same country in Eastern Tibet, and described in the same work by one author. Similarly whilst some Andaman and Nicobar bats, e.g. *Rhinolophus andamanensis* (No. 48) and *Phyllorhina nicobarensis* (No. 63) are included, no mention is made of four *Megachiroptera* from the same islands, viz. *Pteropus nicobaricus*, *Cynopterus brachyotus*, *C. scherzeri*, and *C. brachysoma*.

As might be anticipated, the micro-mammalia are not treated in a manner that will afford much aid to a student. The writer is unacquainted with Mr. Oldfield Thomas's important paper on the rats and mice, and with Mr. Dobson's work on the *Insectivora*. The account of the latter order and of the *Rodentia* is full of errors. The mistakes in the case of the bats are even less excusable, for Dobson's catalogue is quoted, and, to some extent, followed. Had Mr. Sterndale simply taken all his names, descriptions, and localities from Dobson he would have been safe. But he appears to have found a difficulty in making the names and the arrangement in Jerdon's "Mammals" fit into Dobson's scheme, and he has adopted a compromise, with the result that, besides repeating several mistakes of Jerdon's, he has added not a few of his own. Thus, to take a few examples, he gives as two distinct species No. 54, *Hipposideros armiger*, and No. 64, *Phyllorhina armigera*, although he notices that *Hipposideros* and *Phyllorhina* are the same genus. He quotes as distinct species No. 92, *Scotophilus fuliginosus*, and No. 119, *Miniopterus schreibersii*, shown by Dobson to be identical. Similarly No. 58, *Hipposideros larvatus*, is the same as No. 59, *H. vulgaris*. But perhaps the most characteristic instance of error is in the last species in the order No. 121, *Nyctophilus geoffroyi*. This is taken from Jerdon, and no trace of it is said to be found "in Dobson's monograph, which is so exhaustive as far as Asiatic species are concerned." As the bat in question (*N. timoriensis*) is peculiar to the Australian region, it is naturally omitted in Dobson's "Monograph of Asiatic Chiroptera," but it is included in his General (British Museum) "Catalogue of Chiroptera." Jerdon's mistake in classing the species as Indian was founded on what looks very like a printer's error in Blyth's "Catalogue of Mammalia in the Museum of the Asiatic Society."

These details will show the character of the work: mistakes such as those enumerated are to be found throughout. At least a dozen omissions have been noted besides those already mentioned. The book is well printed and illustrated, and many details of osteology, &c., described and figured, so that it is important to show why, despite its merits, it falls far short of what is required in an exhaustive account of Indian mammalia.

There are two portions of the work of which it is possible to speak in terms of high praise. First, wherever